# INTERPRETATION of Dental Radiographs

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# INTERPRETATION OF DENTAL RADIOGRAPHS

## Chapter I

## *Appearance of Normal Dental Tissues*

The dental radiograph in the broadest sense is a representation of the density or radiability of the dental tissues. The denser the object or tissue to be x-rayed, the lighter will be the appearance of the negative or film immediately beneath that tissue. Vice versa, the less the density of the part to be radiographed, the darker will be the film. Dense tissue, then, is characterized by white areas, and less dense tissues by darker areas. Absence of tissue or soft tissue appears black.

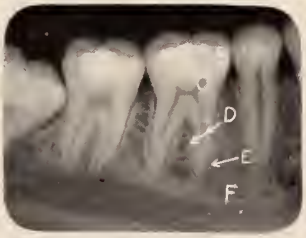



Fig. 1

Figure 1 shows a radiograph of a tooth in its alveolus. (A) represents an amalgam filling, which being dense appears white. Very clearly seen (B) is the enamel which is light but not quite as white or transparent as the amalgam filling. This is due to the fact that it is not quite as dense. (C) shows the dentine and cementum which make up the bulk of the tooth. These structures being less dense than the enamel appear gray. The pulp chamber and canals being soft tissue, show as dark areas.

Filling materials such as amalgam, oxy-phosphate and oxy-chloride of zinc cements, chlora-percha, etc. are white. Synthetic cement or porcelain appears gray, and if a hard tube or rays of great penetration are used, it appears black.

Immediately around the roots of the tooth and entirely surrounding the root is a thin even black line (D). This represents the space occupied by the peridental membrane. Normally this line is *thin, even,* and black. Immediately surrounding this thin, even, black line, is seen a thin even white line. This white line is the thin dense plate of bone which lines the sockets of the

teeth. It is known as the lamina dura or peridental lamella (E). This line normally is *thin*, *even*, and *white* and closely adheres to the dark line representing the peridental membrane. It should be noted, that when conditions are normal that this line entirely surrounds the peridental membrane and is unbroken in its entire length. These two structures should be carefully studied. Any deviation in their contour or relationship is indicative of some trouble. In a later chapter, it will be shown how these tissues are affected by pathological conditions.

(F) shows the appearance of normal cancellous bone. It appears as a white network enclosing irregular black spaces. These black spaces are irregular in size and shape. It can also be seen that there is a harmonious blending of light and dark areas. In short there is no predominance of black or white shadings. To summarize—Normal bone has two characteristics: (a) Well-defined white network enclosing irregular black spaces. (b) Uniform distribution of light and dark areas. In destruction or in morbid increase of bone, the uniformity of the distribution of light and dark areas is destroyed. Under pathological influences, the cancelli or network of bone, lose their well-defined appearance, and the black spaces tend to become regular in size.

## Chapter II

# *Anatomic Landmarks Found in Upper and Lower Jaws*

## Upper Jaw

### *Radiolucent or Dark Landmarks*

*Antrum of Highmore*—This appears as a dark area with a heavy white line along its lower border. It is usually found above the upper molars. Sometimes it includes the bicuspids and canine. From the ordinary radiograph, it cannot be definitely stated that the roots of the teeth penetrate the antrum. Sometimes the negative shows the penetration of the antrum by the teeth, but this cannot be diagnosed with any degree of accuracy. A study of the diagram on the next page will show how roots may appear to enter the antrum, when in reality, they do not.

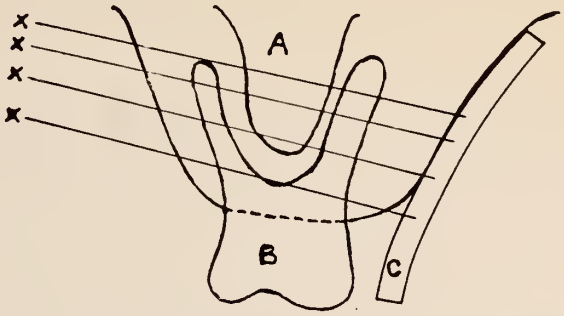



Fig. 2—Cross Section of Superior First Molar and Surrounding Tissue.

A—Antrum. B—Tooth. C—Film. X—X-rays.

The antrum is mistaken by beginners, sometimes, for a cyst. A little later in this chapter, it will be shown how this mistake can be avoided.

*Nasal Cavity*—seen as a dark area a short distance above the upper incisors.

*Incisive or Anterior Palatine Foramen*—appears as a dark area found between the upper central incisors. Sometimes, depending upon the angle at which the radiograph is made, this foramen appears over one of the incisors. In this position it is sometimes mistaken for a pathological condition.

*Nostril spots*—show as dark areas over the incisors.

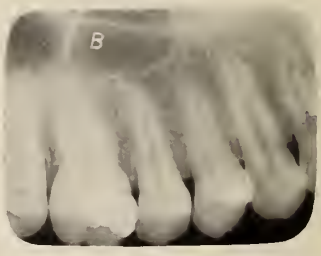
### *Radiopaque or Light Landmarks*

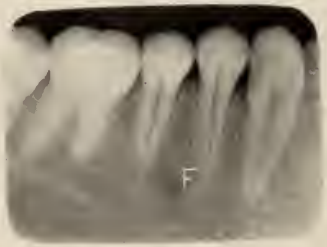
*Malar Bone*—produces a light area above the superior molars. Sometimes this bone is so prominent that it is cast upon the molars and blots out details.

*Coronoid Process*—While this is part of the mandible, it frequently is seen in radiographs of maxillary molars. It usually is found distally to these molars. It is mistaken by beginners for an impacted or unerupted third molar.

*Nasal Septum*—appears as a broad white vertical line separating the nasal cavity into two parts.

# ILLUSTRATING ANATOMIC LANDMARKS



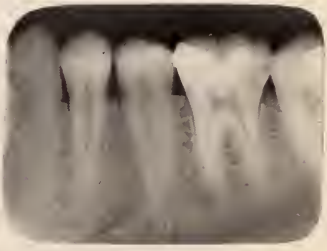






A—Malar Bone
B—Antrum
C—Anterior Palatine Foramen

D—Nasal Cavity
F—Mental Foramen
G—Lingual Tubercle

# ILLUSTRATING ANATOMIC LANDMARKS

H—Inferior Dental Canal

Note: Dark area on Distal surface of right lower first molar—showing a cavity.

## Lower Jaw

### *Radiolucent Landmarks*

*Mandibular Canal*—seen as a broad dark line extending forward from the ramus and runs horizontally along the body of the mandible and terminates in the mental foramen.

*Mental Foramen*—appears as a small round radiolucent area below the bicuspids. This foramen is sometimes mistaken for an abcess about one of the bicuspids.

*Thin portion of lower jaw near the angle of the jaw*—This dark area is caused by the thinness of the bone in this region. It varies in different individuals. Great care should be taken not to mistake this dark area for a bone destruction. Usually this condition is bilateral and a radiograph of the same region on the opposite side will disclose the same condition.

### *Radiopaque Landmarks*

*External Oblique line or ridge*—Seen as a white line at the beginning of the ascending ramus of the mandible. It sometimes is so heavy that it obscures the roots of the mandibular third molar.

*Lingual tubercle*—Shown as a small white area beneath the mandibular incisors at the symphysis. It is sometimes mistaken for sclerotic bone or a bone whorl.

It can readily be seen that the radiolucent landmarks can sometimes be mistaken for bone destruction. If at all in doubt, try any of the four following methods to determine whether or not the dark area is due to a normal space in bone or to a pathological process.

*Vitality Test*—test tooth for vitality. If the tooth responds, then the dark area about it is usually normal. However, great care must be taken in applying the vitality test. There are certain limitations to the test. Teeth with large fillings, or teeth carrying metallic crowns, may respond even though pulpless. Vital teeth in which considerable secondary dentine has formed, will respond weakly or not at all to the test. Great care should be taken that the tooth to be tested is entirely

isolated so that the electric current used for the test should not escape to the gum or adjacent teeth. If it does this, you are apt to receive a response even though the tooth undergoing the test may be pulpless.

*See if lamina dura is intact*—The lamina dura, as has been explained, appears as an unbroken white line about the tooth. This white line is the thin, dense, layer of bone that lines the alveolus or tooth socket. Obviously there can be no involvement of the bone about the tooth as a result of direct infection or irritation through the tooth itself, unless this lamina dura is first broken or destroyed. Therefore, if the lamina dura appears unbroken, and continues about the tooth intact, it can be decided that the dark area is a normal space in the bone.

*Radiograph area at different angles*—Take several radiographs at different angles. If the dark area bears the same relationship to the tooth in all the radiographs so taken, then it denotes that the radiolucent spot in the bone is caused by some pathological process. If the relationship between the dark area and the tooth differs in the radiographs taken at the various angles, then the condition is normal. Let us consider a concrete example. Suppose one radiograph shows a dark area about the upper right central. Then a radiograph is taken at a different angle. The second radiograph shows the radiolucent spot entirely separate and distinct from the apex of the upper right central. We can make a diagnosis in this case, that the dark area is the anterior palatine foramen.

Around a normal space or foramen in bone, such as the antrum, etc., the white line surrounding the dark area is thick, heavy, and uneven. In a pathological destruction of bone, if the white line is present, it is thin, even, and white.

## *Distinguishing Right and Left Sides*

So many people go to the trouble of using an elaborate system of marking the regions they have radiographed, upon the film so that they can tell what region was x-rayed when examined at some future time. This process is entirely unnecessary if a few of the following facts are observed:

The shiny side of the film must be held towards the observer.

This gives what is known as a lingual aspect. With the film so placed, the examiner should imagine himself sitting inside the patient's mouth. This is just opposite to conditions pictured on the average dental chart. If the new translucent base films are used, the dull side must present outward.

Then it must be determined whether the film is a radiograph of the superior or inferior maxilla. This can easily be recognized by remembering the landmarks found in the upper and lower jaws, and by the shapes of the teeth. For instance, the antrum or malar bone would immediately indicate that the radiograph was one of the upper jaw. The lower incisors could easily be distinguished from the uppers because of their difference in size and shape. The lower molars could not be confused with the uppers because of the difference in the number of roots.

When it has been determined that the radiograph is one of an upper or lower, then the apices must be properly placed. If we are dealing with the superior maxilla, the film must be so placed the apices point upward. The opposite should be done in the case of the lower jaw.

Then find the distal end of the film. If we have a radiograph of two bicuspids and a molar, then the distal of that film would be the molar.

The position of the distal end of the film determines whether the film is that of a right side or a left. If the distal is to the right, then we have a right side. If it is to the left, we have a left side. To illustrate:

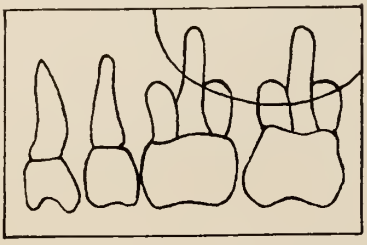


Fig. 3—The distal in Figure 3 is to the right. The antrum and shapes of the teeth indicate an upper jaw. We can call this a radiograph of the upper right bicuspid and molar region.

Chapter III

# Factors Producing Disease of Dental Tissues

Let us for a few moments consider what are some of the causative factors of diseased dental conditions. The disease may manifest itself by destroying the dental tissues or by producing morbid growth or increase in tissue. The former produces what is known as a radiolucent (dark) area in the negative. The latter causes the production of a radiopaque zone (light).

The radiolucent manifestations are caused by:

*Traumatic occlusion*—This produces a diffuse dark area about the entire tooth. The destruction of the bone starts at the neck of the tooth and works upward or downward towards the apex. It produces a condition known as alveoloclasia.

*Lack of occlusion, lack of use, or lack of proximal contact*—This produces almost the same kind of change in the alveolus described in traumatic occlusion.

*Bacteria*—This agent produces a localized or diffuse dark area about the apex of the tooth or at the point of irritation.

*Action of Chemicals*—Arsenic or phosphorous produces a diffuse dark area due to its destructive action upon the tissues.

*Mild Irritation or Pressure* gives rise to the production of a radiolucent or dark, localized, circumscribed area about the apex of the tooth.

The radiopaque manifestations are caused by:

*Traumatic occlusion*—This condition is characterized by a light area about the entire tooth. In addition to this radiopaque area there can be seen the thickening of the peridental membrane about the tooth, and also the increase in size of the lamina dura.

*Thermal shock upon the pulp*—This produces a localized light area about the apex of the affected tooth. Usually accompanying this condition, we can see a recession of the pulp.

*Sclerosis or osteo-sclerosis*—This is the production of dense, hard, bone which replaces the normal bone. It appears white and homogeneous in the radiograph. It is not made up of the white network as is normal cancellous bone. It lacks the cancelli and appears dense and compact.

Sometimes, after the extraction of a tooth, the socket instead of being filled up with normal new bone, is replaced by the hard compact bone. This is probably due to infection which causes a condensing osteitis, resulting in production of this hard bone. The sclerotic bone is sometimes called scar bone, or eburnated bone, or a bone whorl.

*Defense*—Frequently a radiopaque area can be seen surrounding a dark area about the apex of a tooth. This is thought to be an attempt at defense on the part of Nature.

## Chapter IV

# Diagnosis of Pathological Conditions

### Radiolucent Changes

*Pericementitis or Periodontitis*—As was mentioned previously, the normal peridental membrane appears thin, even, and black and immediately surrounds the tooth. As soon as some injurious agent, whether it be mechanical, chemical, thermal, or bacterial acts upon the peridental membrane, a change takes place in this tissue. The membrane thickens or increases in size at the point of irritation.

If the radiograph reveals that the peridental membrane is thickened in its entire length, it is an indication that the irritation is outside the tooth. If the peridental membrane has only a local thickening, say about the apex or at a point of perforation, we know that the trouble is from within the tooth. Traumatic occlusion or lack of occlusion, will first produce a generalized thickening of the peridental membrane. This is seen in the radiograph by an increase in size of the dark space or line between the tooth and the white lamina dura.

Irritation from a decomposing pulp will first manifest itself radiographically by an increase in size of the peridental membrane at the apex. It can be seen from this that the peridental membrane is involved before we get any bone destruction. The membrane should therefore, be carefully studied in order to procure valuable information to prevent future trouble—namely in preventive dentistry.

With the increase in size of the peridental membrane, the lamina dura is next affected. It loses its even contour and becomes irregular. It ceases to closely adhere to the peridental membrane, and sags in several spots.

*Periapical Disturbances*—If the source of irritation is not removed, the bone may become involved and destroyed. This destruction may be accompanied by pain, swelling, etc., or may begin and continue without giving rise to any clinical symptoms.

In connection with the study of periapical disturbances, we must consider the difference between the alveolar abscess and the granuloma or pericementoma as some prefer to call it. The abscess includes a process of suppuration with the attending destruction of the tissues about the tooth and the formation of pus. The granuloma on the other hand involves the production of new inflammatory tissue. The granuloma formation is due to some mild form of infection or irritation or pressure, causing the growth of new tissue. Dr. Kurt Thoma in his book on Oral Roentgenology likens the granuloma to the production of new tissue in tuberculosis (tuberculous granuloma-tubercle) and syphilitic granuloma (gumma syphiloma).

The abscess appears as a dark localized area, irregular in outline, about the apex of the tooth. The granuloma, depending on whether it is still intact, appears in one of two ways. If the granuloma has not broken down, it appears radiographically as a dark, localized, circumscribed area about the apex of the tooth. It is seen as a dark area with a distinct white line about it. If the granuloma has broken down, we get the same appearance as we do in the case of the abscess—namely, a dark area irregular in outline.

The granuloma with the distinct line of demarcation about it may develop into a cyst. In fact any radiolucent area having the above description, and if it is more than $\frac{3}{8}$ to $\frac{1}{2}$ inch in diameter, can be regarded as cysts. A cyst has an epithelial lining which is impervious to fluids. This enables them to grow to such enormous size. The ordinary granuloma, having a fibrous capsule, would disintegrate long before it reached $\frac{3}{8}$ of an inch in diameter.

It will be noticed that some radiolucent areas appear darker than others. It was thought some years ago that the contents of the destroyed area would cause the part to appear darker. Pus was thought to be radio-active and consequently would cause the production of a darker area. This is now known to be erroneous. It is the position of the abscess or granuloma rather than the contents, that determines the appearance of the radiolucent area. If the process of destruction involves the cancellous bone only, then the area will be hazy in appearance. If

one or both plates of bone are involved, then the radiograph appears very dark due to the greatly lessened density.

Very often a patient may present with pain, redness and swelling and a radiograph taken of such a case fails to show any signs of absorption of bone. This is due to the fact that the destructive process has not involved the bone. It is merely subperiosteal and therefore the radiograph fails to show the usual radiolucence.

*Cyst*—It appears as a dark area with a thin white line about it. If a tooth is present in the cyst, we have what is known as a dentigerous cyst.

*Osteitis*—Appears as dark area, indistinct and irregular in outline. Radiographically it resembles the alveolar abscess but it involves a considerably greater portion of bone. The dark area gradually merges into the surrounding healthy tissue. This disease may be acute or chronic. It may cause pain or be present without giving any signs.

*Necrosis*—As does Osteitis, this condition appears as a dark, irregular, indistinct area, gradually shading out from the dark to the light healthy bone. It is usually accompanied with the appearance of sequestra or dead bone. Necrosis is usually the result of poisons or drugs.

*Osteomyelitis*—This is a disease involving the medullary portion of the bone. The radiographic appearance of this condition is characteristic. It has the appearance of wormwood.

*Absorption of Alveolus*, *Alveoloclasia*, *Pyorrhea*—These conditions are easily shown in the radiograph. The bone which normally should extend up to the necks of the teeth, becomes absorbed. The white network is replaced by a dark area wherever the bone has been destroyed. The edges of the alveolar crests are irregular. The peridental membrane, and lamina dura become thickened.

The radiograph may also show what is causing the trouble, such as overhanging fillings, crowns, salivary calculus, etc.

*Caries*—This condition shows as a dark area in the crown of the tooth. The radiograph is especially valuable in detecting this condition when it is present down at the neck of the tooth. When in this position, a cavity is likely to be overlooked in the

ordinary routine examination. Then too, such a dark area appearing underneath a filling will denote secondary decay. It thus can be seen that the radiograph can be of great value in preventive dentistry.

### Radiopaque Changes

*Sclerosis of bone*—This condition appears as a denser or whiter bone. It may be brought about by traumatic occlusion, infection or thermal shock or in abnormal bone repair (See Chapter III).

In bone repair, great care must be taken to see whether you have new bone forming or whether you have sclerotic bone. Normal new bone has the same characteristics of alveolar process, namely the white network enclosing irregular black spaces. New bone is a little lighter in shade than the old bone which it has replaced. Sclerotic bone has been described as dense and white and has no cancelli—in short, no network. Bone undergoing regeneration or repair shows the presence of little bridges of bone spanning the dark area. These bone bridges do not appear when the destroyed bone is being replaced by sclerotic bone.

*Hypercementosis*—This is sometimes known as exostosis. This condition is due to an increased production of cementum. It is seen as thickening or bulging out of the root. The root instead of tapering appears club shaped.

*Sinusitis*—The sinuses being spaces in the bone, normally appear black. In order to make a diagnosis, an antero-posterior film must be made which show the sinuses on both sides of the patient. The relative densities are then compared. As was said previously, the normal sinus appears black. When the sinus becomes filled with pus, or fluid or with some growth, it becomes gray as it resists the passage of the X-rays to some extent. When one sinus appears gray or cloudy in comparison to the other sinus which shows dark, then it can be said that the gray or cloudy sinus is the affected one.

*Pulp Stones*—These stones are due to some irritation of the pulp. They can be found in the pulp chamber or in the pulp canal. Being the same density as dentine, they are seen as

gray bodies. Many authorities maintain that pulp stones are prolific causes of neuralgia.

*Salivary deposits in ducts of glands*—These stones can be readily seen as gray areas. The radiograph assists greatly in their location and removal.

## Conclusion

Before closing, I wish to impress upon the reader that the entire radiograph should be closely examined. The area about the apex of the tooth should not be the only part examined. The examination should include the crown, neck, pulp chamber and canal, peridental membrane, and lamina dura. By doing this, much valuable information which can be used to prevent future troubles, can be obtained.

The crown may show presence of caries which would otherwise be overlooked by the operator. Caries can also be demonstrated radiographically at the neck of the tooth or under a filling. Deposits of salivary calculus can also be seen. The peridental membrane and lamina dura will give the observer an opportunity to see whether the tooth is in traumatic occlusion, lack of occlusion, or whether the trouble originates from within the tooth. The lamina dura and peridental membrane are the first structures to be affected under abnormal conditions. A study of them is therefore important in that phase of dentistry known as preventive dentistry. The pulp chamber may show the presence of pulp stones or new or secondary dentine.

In other words, the radiograph should be used not only to discover present diseased conditions but also to prevent trouble at some subsequent time. Full-mouth x-ray examinations are strongly advised before attempting treatment. The x-ray machine should be used almost as much as the dental engine.

# PERICEMENTITIS
## (*Periodontitis*)

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9

FIG. 4

Shows a marked generalized thickening of the peridental membrane about the buccal roots of the first upper right molar and on the distal of the root of the second bicuspid. This is probably due to the overhanging filling on the mesial surface of the first molar. This filling is pressing on the second bicuspid. The overhanging filling is already causing an absorption of the bone between the second bicuspid and first molar. The absorption is seen as a dark area just beneath the overhang of the filling.

FIG. 5

The peridental membrane on the distal side of the root of the upper left cuspid is thickened. This increase in size of the peridental membrane is very common in fixed bridgework shown in this radiograph. Note the presence of an apex of a root just under the bridge mesially to the first molar.

FIG. 6

Presents an interesting case of traumatic occlusion. The radiograph shows the occlusal surfaces of the teeth all worn down. The pulps have become very much smaller due to the formation of secondary dentine. Pulp nodules or stones (small gray bodies) can be seen in the pulp chambers of the three lower right molars. The peridental membrane about these teeth shows a considerable increase in size. The lamina dura seen as the white line surrounding the dark peridental membrane is very much thicker than normally and is irregular in outline. The cancelli of bone are regular instead of irregular. The bone also shows a predominance of lighter shadings showing that a sclerosis is taking place on account of the trauma it is being subjected to. Irregular gray particles attached to the proximal surfaces of the teeth are deposits of salivary calculus.

FIG. 7

Peridental membrane and lamina dura about lower right first molar show a great increase in size. This is due to the pressure being brought to bear on the first molar because a buccal appliance is wired to it.

FIG. 8

The lower right cuspid and first bicuspid are pulpless teeth showing evidences of root canal fillings. There is a generalized thickening of the peridental membrane. Just distally to the

# PERICEMENTITIS
## (*Periodontitis*)

FIG. 10

FIG. 11

FIG. 12

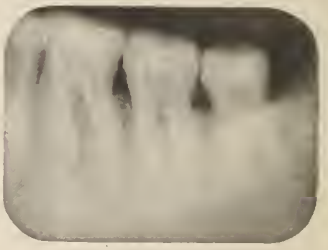


FIG. 13

FIG. 14

FIG. 15

first bicuspid can be seen the socket of the recently extracted second bicuspid.

FIG. 9

Generalized thickening of the peridental membrane about lower left first molar and second bicuspid. In Fig. 4, 5, 6, 7 and 9, note how the lamina dura also increases in size and becomes irregular in outline.

FIG. 10

The superior centrals show a thickening of the peridental membrane. This is due to loss of proximal contact. These teeth have drifted or moved on account of extraction of the laterals. This shows the importance of immediate restorative work.

FIG. 11

Shows a pericementitis or periodontitis about the lower incisors.

FIGS. 12 & 13

These are radiographs of the lower right bicuspid and molar regions. The occlusal surfaces show signs of wear or attrition. This form of traumatic occlusion manifests itself in the radiographs shown, by a thickening of the peridental membrane and lamina dura, and the production of radiopaque (light) areas in the bone, especially seen in FIG. 13.

FIGS. 14 & 15

Both show pericementitis. In addition there is a bulging out or enlargement mesio-distally of the roots of the upper left second bicuspid (FIG. 14) and the lower right first and second molars (FIG. 15).

# GRANULOMA

Fig. 16

Fig. 17

Fig. 18

Fig. 19

Fig. 20

FIG. 16

The superior left temporary cuspid shows a small localized dark area about its apex. This dark area has a distinct white line about it—in short there is a distinct line of demarcation present between the dark area, and the white network indicating healthy bone. This is a granuloma. The granuloma presents a picture of a small localized dark area with a distinct white line about it. Note the presence of the upper impacted left cuspid. In spite of the fact that the permanent cuspid is not pressing on the temporary one, there is a slight absorption of the root of the temporary cuspid.

FIG. 17

The upper left lateral has a porcelain filling on its distal surface which is very close to the pulp. This has probably caused the death of the pulp with its subsequent results. The lateral shows the dark area with the distinct white line about this area. This is another case of granuloma. Note the generalized thickening of the peridental membrane about the cuspid which is carrying a fixed bridge.

FIG. 18

Superior right central lateral and cuspid, each show the presence of a granuloma. The central and lateral show evidences of root canal fillings. In both cases the root canal filling (white lines seen in the dark canals) extend only about half way up the canal.

FIG. 19

Large cavity (dark area) is seen on the mesial surface of the upper left lateral. This caries involved the pulp and caused the death of that organ. A granuloma is present.

FIG. 20

Large granuloma seen about apex of superior right lateral. The dark area seems to overlap the central slightly. It probably has not affected the central but is lapping over either buccally or lingually to the right central. A vitality test of the central would indicate if it has not become involved.

# GRANULOMA

FIG. 21

FIG. 22

FIG. 23

FIG. 24

FIG. 21

The superior right cuspid is here seen carrying a bridge. The canal is only partly filled and there is a small granuloma at its apex.

FIG. 22

Large cavity seen in the entire crown portion of the superior right first bicuspid. Granuloma present.

FIG. 23

Caries present on mesial surface of the superior left second bicuspid. The cavity involves the pulp. A granuloma is seen about the apex of this tooth as well as the crowned first bicuspid. At the gingival margin of the inlay on the mesial surface of the first molar is a dark line. This indicates a space between the inlay and the tooth structure. This is probably secondary decay or else shows that the inlay never really was properly fitted. The x-ray is of great aid in detecting such conditions and is thus of great use in preventing future serious diseased conditions.

FIG. 24

Shows a filling (white) in the occlusal surface of the lower left first molar involving the pulp. Granuloma present about distal root and a pericementitis on mesial. The bone immediately surrounding the granuloma on the distal root appears dense and white. This is probably Nature's means of defense against the granuloma.

# PERIAPICAL ABSORPTION
*(Diffuse)*

FIG. 25

FIG. 26

FIG. 27

FIG. 28

FIG. 29

FIG. 25

The superior right lateral shows a diffuse dark area about its apex (periapical absorption). Unlike the granuloma these diffuse areas of periapical absorption merge into the surrounding tissue. There is no distinct line of demarcation present but a diffuse dark area.

FIG. 26

Filling on mesial surface of superior right lateral involves the pulp. Diffuse area of periapical absorption seen about its apex.

FIG. 27

Large diffuse dark area present about the upper right lateral extending about the apex and down the sides of the root. The dark area seen immediately underneath the crown on the lateral denotes the presence of caries. The central and cuspid show evidences of root canal fillings—the lateral does not. The dark area seen mesially to the central (to the left of the central) is the anterior palatine foramen.

FIG. 28

Shows a diffuse radiolucent area about the entire mesial root of the crowned lower right first molar. The process of destruction has caused a fracture of the mesial root. The gold shell crown on this tooth fits very poorly, overlapping about one-quarter of an inch.

FIG. 29

Cavity (dark area) on mesial surface of lower left first molar which involves the mesial horn of the pulp. Large area of periapical absorption seen taking in a considerable portion of bone about both roots. It can be seen that the dark area shows a hazy appearance and the presence of cancelli. This indicates that the process has only involved the cancellous bone and has left the outer dense plates of bone intact.

# PERIAPICAL ABSORPTION
## (*Diffuse*)

FIG. 30

FIG. 31

FIG. 32

FIG. 33

FIG. 30

Gold shell crown on lower left first molar shows the presence of caries underneath it on distal surface at the gingival margin. Filling material is present in the pulp chamber. Large areas of periapical absorption merging into the surrounding healthy bone present about both roots. In addition there is an absorption of the cementum of the roots. Such a tooth is commonly known as a "dead" tooth. It would be folly to attempt canal work on a tooth which shows absorption of cementum, if this necrosed tissue is not removed by means of root amputation. Large cavity seen on mesial surface of second molar.

FIGS. 31 & 32

The superior left lateral (31) and lower left first bicuspid both show evidences of root canal fillings which do not reach the apices. Small diffuse areas of periapical absorption present. In FIG. 31, the lateral is carrying a detached post porcelain crown.

FIG. 33

Lower right first molar—considerable area of diffuse periapical absorption. There is also present an absorption of the alveolus between the two roots.

# CYST

Fig. 34

Fig. 35

FIG. 34

Large cyst present extending from the lateral to the bicuspid on the left lower jaw. Note the dark area with its distinct white line about it. This is a typical picture that a cyst presents. Radiographically the cyst appears the same as a granuloma, but as explained previously in the text, the cyst attains a much larger size. A true granuloma would break down long before it would reach the size as shown in this picture.

FIG. 35

This figure shows the presence of a cyst in the lower jaw with a lateral and cuspid contained in it. A cyst which has one or more teeth in it, is known as a dentigerous cyst. In addition in the upper jaw an impacted cuspid is present underneath the bridge. Immediately to the left of the lower cuspid is a small dark area. This is the mental foramen.

# CYST

FIG. 36

FIG. 37

FIG. 38

FIG. 39

FIG. 36

A large cyst can be seen involving the upper jaw on the left side extending from central through the first bicuspid region and across the median line. Note the dark area with its distinct white line of demarcation. The lateral and cuspid extend into the cyst and the cementum about the lateral is absorbed. In the upper left hand corner of the radiograph, is seen a dense irregular white body. This was found on operation for removal, to be a piece of shrapnel. A root is present underneath the bridge on the left side in the first bicuspid region.

FIG. 37

Shows a large cyst involving almost the entire superior maxilla.

FIG. 38

This figure presents a multilobular cyst. It is made up of several dark areas with distinct white outlines overlapping one another.

FIG. 39

Just in the middle of this radiograph extending from central to the first molar is seen a cyst. The cuspid root projects into the cyst. The cuspid shows a root canal filling extending about half way to the apex. There is a fixed bridge shown which extends about the entire upper arch.

# CYST

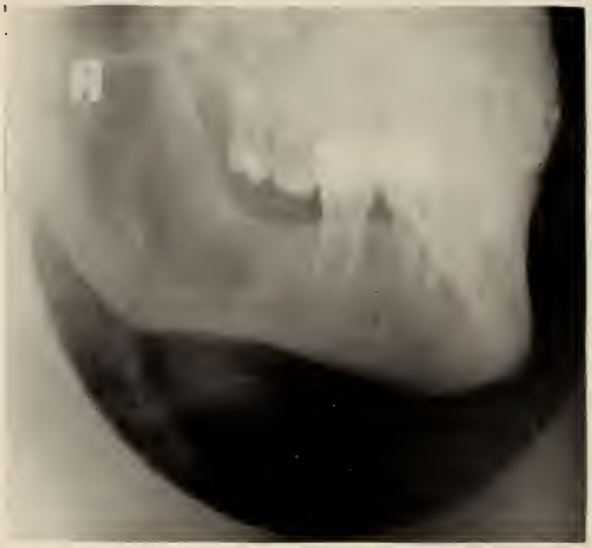


FIG. 40

FIG. 41

FIG. 42

FIG. 43

FIG. 40

Shows the presence of an abnormally large cyst which involves the entire ramus of the mandible. Not only does it involve the ramus but it extends forward involving the second molar region.

FIG. 41

Cyst present about superior right central and lateral.

FIG. 42

The left central crown portion of the tooth is missing. A large cyst extending from the median line to the cuspid is present.

FIG. 43

Shows an edentulous mouth. A small cyst is seen just in the median line. Note how clear and distinct the white line is, surrounding the dark area.

# ALVEOLOCLASIA (*Alveolar Absorption*)

FIG. 44

FIG. 45

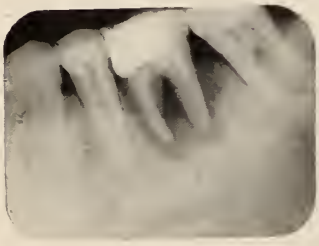


FIG. 46

FIG. 47

FIG. 48

FIG. 49

FIG. 44

Superior right molar region. This radiograph presents a typical case of alveolar absorption. The white network which represents normal bone should extend down to the necks of the teeth. In FIG. 44 it can be seen that the white network has been replaced by dark areas, denoting a destruction of the alveolus. On the mesial surface of the second molar is an overhanging filling. The alveolus about the first molar is almost entirely absorbed.

FIG. 45

The alveolus on the distal surface of the upper left second molar and mesial of the third molar, is entirely destroyed. There is a small area of destruction of the alveolus between the first and second molar. Note the thickening of the peridental membrane of the second bicuspid and first molar. This condition always take place before there is any actual destruction of bone.

FIG. 46

The alveolus about the lower right first molar is entirely destroyed. It is remarkable how such teeth remain in the mouth with no supporting tissue. On close observation it can be seen that the occlusal surfaces of the teeth have been worn down. This probably is the cause of the alveoloclasia.

FIG. 47

Alveolar absorption present between second and third molars. The third molar is partially impacted. There is a small pocket between the first and second molars.

FIG. 48

Considerable alveoloclasia present about all the three molars.

FIG. 49

The first molar has been extracted and as a result the second molar is drifting forward. This condition invariably results in the production of alveolar absorption which is seen on the mesial of the second molar. In addition there is a generalized pericementitis due to lack of proximal contact.

# ALVEOLOCLASIA (*Alveolar Absorption*)

FIG. 50

FIG. 51

FIG. 52

FIG. 53

FIG. 54

FIG. 55

FIG. 50

The alveolus about these teeth has been entirely destroyed. Note the considerable thickness of the peridental membrane about these teeth at the apex. This is thought to help hold the tooth in place after the alveolus has been destroyed.

FIG. 51

Considerable absorption of the alveolus present about the bicuspids and first molar. The crown portion of the first bicuspid shows the presence of caries. The second bicuspid has a large inlay on its distal surface extending down to the root portion and shows secondary decay underneath the inlay. The root canal is partly filled. Just below these teeth the bone is seen as being very dense and white. This is due to a condensing osteitis probably the result of traumatic occlusion. Normal bone should not show this predominance of white but should show a harmonious blending of the white and dark areas.

FIG. 52

Alveolar absorption present about the left central and lateral extending almost to the apex. There is a large space present between the porcelain crown of the left central and the root portion of this tooth.

FIG. 53

Alveoloclasia present about the lower incisors. Note how the dark areas surround the teeth almost in their entirety. Also note the thickening of that part of the peridental membrane which is still intact.

FIG. 54

Same as FIG. 53. In addition however deposits of salivary calculus can be seen on the mesial and distal surfaces of these teeth. These salivary deposits show as small gray irregular bodies attached to the teeth. Note how the incisal edges of the teeth have been worn down.

FIG. 55

The superior left lateral shows the presence of alveolar absorption due to the pressure of an extension bridge on it.

# FRACTURE

Fig. 56

Fig. 57

FIG. 56

Shows a jagged dark space in the lower right bicuspid region, indicating a fracture. It should be noted that this dark space extends entirely through the mandible. This fracture was due to a bullet wound. The appliance (seen in white) extending around the buccal surfaces of the teeth is used to hold the broken parts in apposition. In the upper jaw there is considerable absorption of the aveolar process present.

FIG. 57

Shows a dark line indicating a fracture, passing almost vertically through the mandible in the region of the second molar. The second molar is right in line of the fracture. There is a slight displacement of the fractured parts. Note the broad dark line extending forward from the ramus running along beneath the molar and bicuspid teeth and terminating in the dark space which is the mental foramen. This dark line is the inferior dental canal.

# FRACTURE

FIG. 58

FIG. 59

FIG. 60

FIG. 58

Indicates a fracture of the root of the superior left central. The dark line which is the space between the two broken parts of the tooth is indicative of a fracture.

FIG. 59

This radiograph shows a fracture extending obliquely upward from the angle of the jaw through the second molar. The mesial root of this tooth is broken away from the tooth. There is no displacement of the parts. Immediately beneath the second molar and the body of the mandible is a gray semicircular object which is the hyoid bone. To the right of the ramus is a dense white column which is the vertebral column.

FIG. 60

Shows a fracture extending horizontally through the root of the left upper central. Very often it is difficult to distinguish a fracture of this kind when there is no displacement or separation of the parts. In such cases it becomes necessary to exert pressure on the crown of the tooth while the radiograph is being taken. This pressure will separate the broken fragments of the tooth if a fracture is present, and the radiograph will accordingly disclose it.

## Osteitis, Osteomyelitis and Thin Portions of Bone

Fig. 61

Fig. 62

Fig. 63

Fig. 64

### Figs. 61 & 62

Fig. 61 represents a radiograph of the lower left bicuspid and molar region. A dark area of considerable extent is present extending from the second bicuspid through the molars. Fig. 62 was radiographed after 61 and it represents the lower right bicuspid and molar region. It also shows a similar dark area. These dark areas both are normal. They represent thin portions of bone found sometimes in the region of the angle of the lower jaw. Usually this condition is bilateral and a radiograph taken of both sides will show similar radiographic appearance.

### Fig. 63

The lower centrals show root canal fillings in them extending in one case through the apex and in the other, just short of the apex. There is a large diffuse dark area involving the bone about all the incisors and extending downward. This dark area is irregular in outline, gradually merging into the surrounding healthy bone. This is a case of osteitis.

### Fig. 64

Shows an osteomyelitis of the entire superior maxilla. The bone presents a mottled appearance. It also presents a wormwood appearance. Note that the cancelli found in normal bone are entirely lacking here. The edge of the bone extending from the left central to the first bicuspid, is irregular in outline, and many loose fragments of bone are present here.

# OSTEOMYELITIS

FIG. 65

FIG. 65

Shows an osteomyelitic involvement of the entire mandible. Note the wormwood appearance of the bone and the dark channels passing through it. This radiograph presents a typical picture of osteomyelitis.

# HYPERCEMENTOSIS

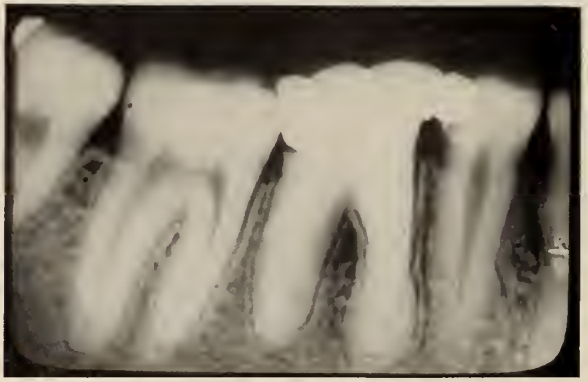


FIG. 66

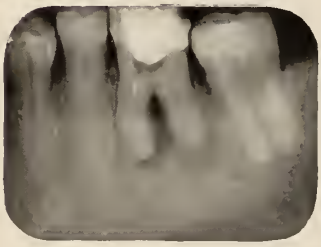


FIG. 67

FIG. 67A

FIG. 68

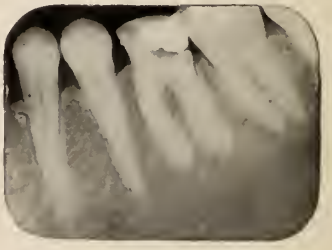


FIG. 69

FIG. 66

Shows a case of hypercementosis, sometimes known as exostotis. This condition is the result of the increased production of cementum. It is characterized in the radiograph by an increase in size of the root where this process occurs. It is seen in this radiograph as a mesio-distal enlargement of the mesial root of the lower left first molar. In short the root instead of tapering as it normally does, bulges out. Note the marked generalized thickening of the peridental membrane about this tooth and the other teeth in this radiograph. At the junction of the apical and middle thirds of the root (mesial side) of the second bicuspid, hypercementosis is present. Invariably hypercementosis at this point is indicative of traumatic occlusion.

FIG. 67

The lower right first molar shows a filling entering the pulp chamber. There is a small thin regular white body in the mesial root of this tooth which is a broken fragment of a broach. There is a hypercementosis of both roots present.

FIG. 67A

The upper right second bicuspid shows a root canal filling extending part of the way to the apex. Note the mesio-distal enlargement of the root of this tooth (hypercementosis.)

FIG. 68

The superior right second bicuspid is carrying a crown and a pontic. The stress on this tooth has caused the production of a hypercementosis.

FIG. 69

Shows an involvement of the pulp chamber of the lower right first molar. The roots of this tooth both show mesio-distal enlargements which is indicative of hypercementosis.

## SCLEROSIS (*Condensing Osteitis*)

Fig. 70

FIG. 70

Shows a grayish body extending downward from between the two lower first and second molars almost to the lower border of the body of the mandible. This is known as sclerosis or sclerotic bone. The patient in this case reported a fracture of the jaw some years previously. The bone instead of healing as it should normally and presenting the usual cancellated appearance, shows this grayish area without the presence of cancelli. This sclerotic bone is the result of a process of condensing osteitis. As was explained previously in the text, great care should be taken not to confuse this scar bone with new normal bone formation. Normal regenerated bone appears almost like normal cancellous bone except that it is a little lighter in shade. It has both characteristics of normal alveolar process. Sclerotic bone presents a uniform white or gray appearance and has no cancelli.

## SCLEROSIS (*Condensing Osteitis*)

FIG. 71

FIG. 72

FIG. 73

FIG. 74

FIG. 75

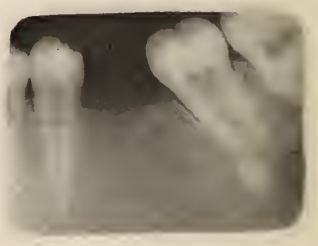


FIG. 75A

FIG. 71

Shows a small radiolucent area about the apex of the right upper cuspid. Immediately around this dark area is an area of dense white bone which is unlike normal bone. This is sclerotic bone and is thought to be a defense against the bone destruction that is taking place.

FIG. 72

Just mesially to the lower left second molar is a dense white circular object. It presents no cancelli and is homogeneous in appearance. This is sclerosis.

FIG. 73

Between the bicuspids on the upper left side is dense white bone. This is sclerotic bone.

FIG. 74

Just mesially to the lower left molar is present a dense gray area. This is sclerotic bone filling in the entire socket of the extracted molar. In this case the socket instead of healing or filling in with normal new bone, was replaced with this scar bone.

FIG. 75

Just mesially to the lower second molar near the apex, is a small circular gray body. This is sclerotic bone or a bone "whorl" or eburnated bone. The late Dr. Cryer reports that in very many cases these bone whorls are prolific causes of trifacial neuralgia. He reports that the removal of these bodies have been successful in the relief of this disease. Upon operation these areas of sclerotic bone appear dense and hard.

FIG. 75A

Just beneath the lower right second molar is a small round white body. This is sclerotic bone. In the pulp chamber there are two pulp stones. (small gray bodies).

# ODONTOMA AND STONE IN DUCT

FIG. 76

FIG. 77

FIG. 78

FIG. 76

The radiograph in this case was taken to determine what was preventing the eruption of the lower right first permanent molar. The x-ray shows that a large odontoma is preventing this tooth from erupting. The odontoma here shown is made up of the second and third molars. It shows as a large, light area in the bone. These odontomas are tooth tumors being made up of the enamel dentine and cementum. Upon operation this mass was found to contain about fourteen separate and distinct denticles or tooth particles. The permanent cuspid and bicuspids are seen immediately underneath the temporary teeth.

FIG. 77

Shows a small gray body immediately beneath the left lateral and cuspid. This is a stone in the duct of the sublingual gland. The patient in this case presented himself at the clinic complaining of very severe pain in the floor of the mouth. There was extreme swelling present and also an excessive flow of saliva. A radiograph was taken which disclosed this deposit of calculus in the duct.

FIG. 78

The radiograph in this case was taken to determine what was preventing the eruption of the upper right central. This tooth is shown in the radiograph lying almost horizontally and pressing against the left central. Immediately beneath this impacted right central are about five or six dense white bodies clustered together. This is an odontoma. The temporary right central is seen present.

# SHARP POINTS OF PROCESS AND BROKEN NEEDLE

FIG. 79

FIG. 80

Fig. 79

Shows the dark areas representing the sockets of the lower right first molar. At the extreme ends of these sockets are to be seen white sharp points extending upward. These are sharp points of process which give considerable pain and discomfort if not trimmed down.

Fig. 80

In the ramus of the mandible slightly above the lower molar teeth is a fine, thin, even white line about five-eights of an inch in length. This is a needle which was broken off during the administration of a mandibular injection.

# IMPACTED AND UNERUPTED AND DEVELOPING TEETH

FIG. 81

FIG. 82

FIG. 83

FIG. 85

FIG. 84

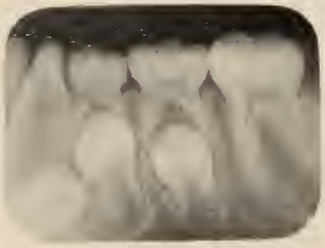


FIG. 86

FIG. 87

FIG. 81

Shows two superior centrals which have not as yet completely formed. Note the extreme width of these teeth. They are almost one and a half times as wide as the average tooth.

FIG. 82

Shows a supernumerary tooth above the left upper central. The lateral and cuspid have wide open apices. These apices have not as yet fully formed and should not be mistaken for a pathological condition. In the case of wide open apices due to incomplete development of these teeth, the lamina dura which is the white line surrounding the peridental membrane appears intact around the entire tooth.

FIG. 83

Shows a left central with the incisal edge and crown portion pointing upward.

FIG. 84

Shows a supernumerary tooth above the superior left central. The lateral apex has not as yet fully formed.

FIGS. 85 & 86

Show the bicuspids present beneath the temporary molars. In both cases the permanent first molars have erupted. Note how the bicuspids appear to be lying in a sac with a white line surrounding this dental sac.

FIG. 87

Shows two supernumerary teeth (unerupted), one between the centrals and one above the right central.

# IMPACTED AND UNERUPTED TEETH

FIG. 88

FIG. 89

FIG. 90

FIG. 91

FIG. 92

FIG. 88

Shows an unerupted third molar pressing against the second molar.

FIG. 89

Shows an impacted lower right bicuspid lying horizontally.

FIG. 90

Also shows a lower right impacted bicuspid lying lingually to the second molar.

FIG. 91

Shows an impacted bicuspid lying horizontally with crown portion pointing towards the observer. The dark area with the white line about it is a space or sac in which the tooth is lying.

FIG. 92

Shows an impacted upper right cuspid.

# SINUSITIS


Fig. 93

FIG. 93

The triangular spaces above the upper molar teeth and just below the dark circular spaces representing the orbits are the maxillary sinuses. The left sinus (observer's left) appears gray in comparison to the right sinus which is dark. Normally the sinuses being spaces in bone should appear black. However, if they become filled with fluid, pus, or some growth, they naturally will appear gray in the radiograph. The only way a diagnosis can be made radiographically as to whether a sinusitis is present is to take an antero-posterior view and compare the relative densities of the sinuses. The one that appears gray, (or if both appear gray) is the affected sinus.

# *Index*

P



R



S



T



U

# *Definitions of Terms Used*

Attrition—Wearing away of the occlusal or incisal surfaces of the teeth.

Alveoloclasia—Absorption of the bone of the alveolus.

Alveolus—The socket of the tooth.

Bone whorl—Small round area of sclerotic or dense bone.

Cancelli—A network made up of the fibres of spongy bone (cancellous bone). In the radiograph it appears as a white network enclosing irregular black spaces.

Cancellous Bone—The spongy bone found between the dense outer plates of bone.

Caries—Decay of tooth.

Condensing osteitis—Inflammation of bone resulting in the formation of hard dense bone.

Cyst—A sharply defined area containing an abnormal collection of fluid and is unprovided with a channel for outflow of this fluid. They have a distinct lining membrane.

Distal surface of tooth—That surface of the tooth farthest away from the median line.

Eburnated bone—Hard dense bone—see bone whorl.

Excementosis—Increase in the amount of cementum forming an enlargement or bulging out of the root of the tooth.

Exostosis—In dentistry same as excementosis or hypercementosis.

Granuloma—An inflammatory new growth of tissue due to some mild form of irritation or infection. Radiographically it appears about the apex of the tooth or in edentulous areas as a small localized dark area with a distinct white outline.

Hard Tube—X-ray tube of high vacuum resulting in the production of X-rays of great penetration.

Hypercementosis—Same as excementosis.

Lamina dura—A thin layer of dense bone lining the sockets or alveoli of the teeth.

Mesial surface—That portion or surface of the tooth nearest the median line.

Necrosis—Disorganization and death of tissue usually due to deprivation of nutrition.

Occlusal surface—The grinding surface of the bicuspids and molars.

Odontoma—A tooth tumor—a tumor in connection with teeth or made up of dental tissues.

Osteitis—Inflammation of bone.

Osteosclerosis—Hardening of bone—see eburnated bone.

Osteomyelitis—Inflammation of the marrow of the bone.

Pericementitis—Inflammation of the peridental membrane.

Peridental lamella—Another name for lamina dura.

Peridental membrane—A fibro-elastic membrane interposed between the tooth and alveolus.

Periodontitis—Inflammation of the peridental membrane.

Pulp Stone—A small body or nodule present in the pulp chamber or canal. Radiographically it has same density as dentine.

Radiograph (noun)—A resulting product (such as film or print) of the radiographic process.

Radiograph (verb)—Act of making a radiograph.

Radiolucent—That term which is applied to substances that allow X-rays to pass through but offer slight resistance to their passage.

Radiopaque—Substances which do not allow X-rays to pass through them.

Radioparent—Substances allowing X-rays to pass through them and offer no resistance to their passage.

Sclerosis of bone—Hardening of bone—see eburnated bone.

Sinusitis—Inflammation of the sinuses.

Subperiosteal—Beneath the periosteum. The periosteum being a fibrous membrane covering the bone.

Supernumerary tooth—Tooth exceeding normal number.

Traumatic occlusion—Abnormal occlusal or biting stress.

*Memoranda*

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